

WHAT IS CLAIMED IS:

1. A method of producing a metal pattern on a substrate comprising the steps of:
 - a) providing a first photoimageable film on the substrate;
 - 5 b) providing a second photoimageable film directly over the first photoimageable film;
 - c) placing a negative image of the desired metal pattern over the second photoimageable film and exposing the first photoimageable film and the second photoimageable film to actinic radiation;
 - 10 d) developing off uncured areas of the first photoimageable film and the second photoimageable film to produce an image on the substrate;
 - e) depositing metal onto the substrate; and
 - f) stripping the first photoimageable film and the second photoimageable film from the substrate to leave the metal pattern on the substrate.
- 15 2. The method according to claim 1, wherein the first photoimageable film has a faster development time than the second photoimageable film.
3. The method according to claim 2, wherein the development dwell time (in 1%
20 potassium carbonate at 90 °F) of the first photoimageable film is between about 40 and about 60 seconds and the development dwell time of the second photoimageable film is between about 80 and about 120 seconds.
4. The method according to claim 1, wherein the cure energy of the first
25 photoimageable film is between about 30 and about 100 mJ and the exposure time of the second photoimageable film is between about 5 and about 20 mJ (preferably 15 mJ).
5. A method according to claim 1, wherein the first photoimageable film and the second photoimageable film are each formulated from a composition comprising one or
30 more binders, one or more monomers, a photoinitiator, and a suitable solvent.
6. A method according to claim 5, wherein the one or more binders are selected from the group consisting of (meth)acrylic acid, itaconic acid, ethyl(meth)acrylate, n-butyl

(meth)acrylate, propyl (meth)acrylate, methyl (meth)acrylate, octyl acrylate, n-hexyl acrylate, t-butyl acrylate, secbutyl acrylate, isobutyl acrylate, 2-ethyl hexyl acrylate, styrene, isobutyl methacrylate, substituted styrenes, and vinyl esters.

5 7. A method according to claim 5, wherein the one or more monomers are selected from the group consisting of acrylic and methacrylic acid and acid esters, vinyl ethers, polyester acrylates, and polyurethane acrylates.

8. A method according to claim 7, wherein the one or more monomers are selected
10 from the group consisting of allyl (meth)acrylate, tetrahydrofurfuryl (meth)acrylate, isodecyl (meth)acrylate, 2(2-ethoxyethoxy) ethyl (meth)acrylate, stearyl (meth)acrylate, lauryl (meth)acrylate, 2-phenoxyethyl (meth)acrylate, glycidyl (meth)acrylate, isobornyl (meth)acrylate, tridecyl (meth)acrylate, isooctyl (meth)acrylate, caprolactone (meth)acrylate, polyethylene glycol (meth)acrylate, propylene glycol (meth)acrylate,
15 ethylene glycol (meth)acrylate, 1,3-butylene glycol di(meth)acrylate, 1,6-hexanediol di(meth)acrylate, neopentyl glycol di(meth)acrylate, polyethylene glycol di(meth)acrylate, polypropylene glycol di(meth)acrylate, ethoxylated A di(meth)acrylate, propoxylated bisphenol A di(meth)acrylate, alkoxylated cyclohexane dimethanol di(meth)acrylate, cyclohexane dimethanol di(meth)acrylate, trimethylolpropane tri(meth)acrylate,
20 ethoxylated trimethylolpropane tri(meth)acrylate, propoxylated trimethylolpropane tri(meth)acrylate, tris (2-hydroxy ethyl) isocyanurate tri(meth)acrylate, pentaerythritol tri(meth)acrylate, ethoxylated glycerol tri(meth)acrylate, propoxylated glycerol tri(meth)acrylate, pentaerythritol tetra(meth)acrylate, ethoxylated pentaerythritol tetra(meth)acrylate, propoxylated pentaerythritol tetra(meth)acrylate, dipentaerythritol
25 penta(meth)acrylate, dipentaerythritol hexa(meth)acrylate, polyester (meth)acrylates, polyurethane (meth)acrylates, and combinations of the foregoing.

9. A method according to claim 5, wherein the photoinitiator is selected from the group consisting of benzoin ethers, benzil ketals, acetophenones, benzophenones, and
30 combinations of the foregoing.

10. A method according to claim 5, wherein the composition that makes up the first photoimageable film or the second photoimageable film further comprises one or more

additives selected from the group consisting of adhesion promoters, stabilizers, flow additives, surfactants, and other additives.

11. The method according to claim 5, wherein the composition is coated over a carrier
5 sheet, and the solvent is subsequently removed.

12. The method according to claim 11, wherein the carrier sheet is selected from the group consisting of polyester and polyethylene terephthalate.

10 13. The method according to claim 11, wherein a removable protective layer is applied to the top of the composition.

14. The method according to claim 1, wherein the first photoimageable film is applied to the substrate by lamination using pressure, heat, or heat and pressure, and the protective
15 cover layer is removed.

15. The method according to claim 15, wherein the second photoimageable film is applied over the first photoimageable film by lamination using pressure, heat, or heat and pressure, and the negative image of the desired metal pattern is applied over the second
20 photoimageable film with the protective cover layer still in place.

16. The method according to claim 1, wherein after development, the second photoimageable film overhangs the first photoimageable film on the substrate.

25 17. The method according to claim 1, wherein the metal layer is deposited by sputter coating.

18. The method according to claim 17, wherein the metal is gold.

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